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ABSTRACT

This study examined the academic and affective growth of peer mentors in a minority engineering program which encouraged relationships between freshmen pre-engineering students and upperclass division mentors at a large, land-grant university in the Southeast. A total of 14 mentors in a newly established minority mentoring program, who were themselves minorities, completed weekly journal entries on their experiences. One primary pattern that emerged from the journals was the reinforcement and improvement of the mentors' already existing academic skills that occurred as a result of their tutoring experiences in interactive learning laboratories and involvement in problem-solving workshops. The simple and constant review of fundamental principles common to the engineering core of study helped the mentors in their own academic pursuits. The journals also captured affective change in confidence and sense of purpose within the mentoring community. The results suggest that although the upperclass peer mentors were not the target population of the minority engineering program, they benefitted both academically and affectively from their roles as mentors within the program. An appendix provides the weekly prompts for journal entries. (MDM)

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The Affective and Academic Benefits for Mentors in a Minority Engineering Program

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Abstract

Examined in this study was the academic and affective growth of peer mentors (N = 14) in a minority engineering program at a large land-grant university in the Southeast. Analyzed were the comments in journals written during the mentors' first quarter of tutoring and mentoring. Although the journals were established at the beginning of the quarter as a forum to discuss the mentors' perspectives on program development and evaluation, the journals also captured growth in the following areas: (a) cognitive skills such as critical thinking and (b) affective change in confidence and sense of purpose within the engineering community. During the initial mentor training session, the participants were given blank journals and were asked to respond in writing to a weekly prompt. At the end of the quarter, the comments within the journals were organized and coded into categories of cognitive growth and affective growth. Conclusions were drawn based upon the pattern of these comments. The findings of the study suggest that, although the upperclass peer mentors were not the target population of the minority engineering program, they benefitted both academically and affectively from their role as mentor within the minority engineering program.

The Affective and Academic Benefits for Mentors in a Minority Engineering Program

Mentoring–"an intensive, one-to-one form of teaching in which the wise and experienced mentor inducts the aspiring protégé into a particular, usually professional, way of life" (Parkay, 1988, p. 196). Such was the definition adopted by the participants of a minority engineering program which encouraged relationships between freshman pre-engineering students and upperclass division mentors at a large-land grant university in the Southeast. The program encompassed many components, from formal tutorial instruction to informal dinners and celebrations, in which the mentors played a vital role and, as suggested by Parkay's (1998) definition, inducted their fledgling students into the engineering "way of life."

Part of the impetus for including a mentoring component in the minority engineering program from the program's inception was the results of a qualitative study in which engineering students recommended the need for networking with upperclass mentors to ease the transition of freshman students into the university environment (MacGuire & Halpin, 1995). In this particular minority engineering program, the mentors, all minorities themselves, were assigned specific freshman minority pre-engineering students with whom they worked with regularly in a variety of settings. For instance, the mentors acted as tutors to the freshman students in an interactive learning laboratory where the students honed mathematical and scientific skills common to their core of studies. The mentors also met regularly with the same freshmen to advise them in structured, weekly problem-solving workshops, suggesting alternative methods for defining and analyzing problems related to their engineering courses of study. During these sessions, they also

shared conversations concerning freshman year experiences, trials, and challenges. In addition, the mentors met with the freshmen to share meals, enjoy movies, bowl, and participate in study sessions at homes and apartments–whatever suited their particular likes and dislikes. Indeed, in this particular program, mentoring was more than a required relationship between a student and teacher. As Gehrke (1988) suggested, the mentoring relationship "can be seen as an example of gift giving in the gift exchange economy" (p. 192). The relationship between mentor and mentee extended beyond the mere giving of instruction, as suggested in a tutorial relationship. The relationship intimated the assuming of multiple roles by the mentor–"door opener, information giver, supporter . . . something akin to philosopher" (Gehrke, 1988, p. 192). It seemed obvious that the mentees (freshman pre-engineering students) were expected to be the recipients of the benefits of the mentor and mentee relationship. Yet the upper-class division mentors were overlooked in the evaluation process when considering benefits of this retention and academic support program. Presumably, the mentors also reaped the benefits of the mentoring relationship.

Researchers (Cloward, 1976; Maxwell, 1994; Pickens, & McNaughton, 1988; Strodtbeck, Ronchi, & Hansell, 1976) have concluded that the tutoring process has academic and psychological benefits to the tutor as well as the tutee. For instance, Pickens and McNaughton (1988) noted that tutors displayed reading gains on standardized reading tests compared to a control group of non-tutoring peers. Cloward (1976) stated that "the tutor was the major beneficiary of the tutorial experience" (p. 227) in terms of academic gains. Possibly, because tutors must relearn and reanalyze information in order to teach it, they eventually learn familiar material more thoroughly and confidently during the tutoring process.

Gains from the tutoring process were not limited to the academic domain. Maxwell (1994) provided numerous stories and anecdotes from tutors, capturing their tutoring experiences. She devoted an entire chapter of her work, When Tutor Meets Student, to the gains experienced by the tutors during the tutoring process, gains such as increased understanding of individual differences, better communication skills, and increased tolerance of individual differences. Strodtbeck, Ronchi and Hansell (1976) indicated that tutoring positively affected the tutors' attendance records; competency in the discipline they were tutoring; and, in some cases, their self-esteem and self-efficacy.

Peer tutoring programs to assist underprepared freshmen at colleges and universities are increasing in number (Maxwell, 1990), and the social and academic effects to both the tutors and the students have been proven repeatedly. Can the same conclusions from the literature regarding tutors be drawn for peer mentors, an intensified relationship compared to that of tutors? Are the gains limited to academic gains or do they extend to the affective domain as well? As suggested by Gehrke's (1988) definition, if mentoring extends beyond mere gift giving to an actual exchanging of gifts, exactly what gifts do the mentors receive through the mentoring experience? The purpose of this study is to explore the academic and affective gains that the mentoring relationship has provided for the mentors in a minority engineering program.

Method

Mentors (upperclass division, undergraduate, minority engineering students) were selected and trained to participate in a newly created minority engineering program (N =14). Four female and ten male mentors participated in this study. The mentors were selected according to demonstrated interest in the program and interviews with the program director. After being

selected, the mentors attended a 2-hour training session at the beginning of the quarter, addressing roles, responsibilities, and program procedures.

One of the program procedures the mentors were trained to attend to weekly was responding to program evaluation prompts in a mentor journal. Weekly prompts were posted on a bulletin board in the interactive learning laboratory, and the mentors wrote in response to these prompts at their convenience. The prompts concerned program organization, organizational development, student development, and personal development. (See Appendix.) The researcher would read and respond to the prompts on a weekly basis in order to encourage discourse concerning program development and improvement. Qualitative data in the form of these journal responses from the mentors concerning the evolution and program development of the minority engineering program were collected throughout the entire quarter of program involvement.

Although the intent of the journals was to gather information concerning formative program evaluation from the staff, the researcher completed a content analysis of the comments, noting examples of academic and affective growth as stated by the mentors. In spite of the prompts focusing on program development, the numerous comments concerning personal development made the organizing and coding of the comments into the categories of academic and affective gains of the mentors an easy task. Because such a small number of mentors ($\underline{N} = 14$) was involved in the program, any quantitative data collection or analysis would be inappropriate.

Results and Discussion

Academic Gains

One primary pattern that emerged from the journals was the reinforcement and improvement of the mentors' already existing academic skills that occurred as a result of their

tutoring experiences in the interactive learning laboratory and involvement in the problem-solving workshops. For instance, one mentor wrote that he had become a "better problem solver" because he had learned to "think consciously about [his] problem-solving technique"–one of the primary objectives of the problem-solving workshops for the freshmen. Similarly, another mentor stated the following:

> I feel that the program has made me re-evaluate some of my common practices and viewpoints. I take as many good ideas, strategies, and concepts from the workshops and try to incorporate them into strategies and techniques that I am presently using. . . . I have noticed a change in my thinking schema when I am ready to approach a problem.

Another mentor noted that she transferred workshop information into her study strategies: "After our test-taking workshop, I used some of the tips to help me relax for the test. It was great. I have learned a lot."

One mentor noted that he "had taken some of the skills learned during the workshops and implemented them" in other areas of his personal study. He further stated the following:

> I have noticed some positive changes in myself. As the students ask questions and I take part in the workshops, different concepts which I had forgotten or just wasn't using are brought back into consciousness. Then I am motivated to do what I haven't been doing so I can encourage the students to do the same.

Another mentor stated the following, concurring with his colleague:

> I have noticed that I use the suggestions given in the critical thinking lab in developing my own study habits. I also feel that I must "practice what I preach" because the students will look at me as an example.

It appeared as though the suggested learning strategies emphasized in the problem-solving workshops transferred to the mentors as readily as it did to their freshman mentees. The upperclass mentors were as likely to incorporate suggestions and implement academic strategies which they had learned as a result of their involvement in the minority engineering program into their own personal study sessions as were the pre-engineering students. The comments consistently suggested that the mentors grasped and incorporated the concepts taught in the problem-solving workshops and adapted the concepts to fit their own upperlevel courses in which they were enrolled.

Because the mentors realized that they were acting as role models for the freshman students, the minority engineering program also provided incentive or motivation for the mentors to incorporate these learning strategies into their own work and study sessions. The mentors experienced an increased awareness of their own strategies because they wanted to ensure that they were role-modeling the most effective techniques for their mentees in and out of the workshop and lab settings. The mentors were motivated to succeed academically by refining their own study habits and problem-solving techniques and honing their own cognitive skills in order to illustrate effective strategies to their mentees.

In addition to the concepts taught in the workshop, the constant questioning by the freshman students in the tutorial sessions also encouraged mentors to review some fundamental concepts from their earlier academic careers. For instance, one mentor commented that he was "forced to review previous subjects" which he thought inadvertently helped him in his current studies. In another comment, a mentor stated that the program had "provided him with much needed review of key concepts in order to provide adequate assistance to the students." Another

student noted that tutoring had helped him in "brushing up on the skills [he] rarely had a chance to use," and later he stated that "it feels good to be able to work out problems on material that [he] felt [he] had long forgotten." And yet another mentor stated the following: "As a student, I feel that I have developed better study habits and developed in the way I explain concepts to students at different levels and methods of learning."

The simple and constant review of fundamental principles common to the engineering core of study helped the mentors in their own academic pursuits. Through the constant process of clarification of ideas and varying of teaching methodologies during tutoring sessions, the mentors were able to look at seemingly simple problems from multiple perspectives. This educational process helped the mentors to gain a thorough understanding of fundamental concepts in their engineering studies. The tutoring component of the minority engineering program had a two-fold effect: academic assistance for the freshmen and unintentional academic assistance to the mentors.

Affective Gains

Another unintentional side effect of the minority engineering program that the mentors experienced was the development of personal skills–communication, confidence, identity. In fact, the mentors adopted multiple identities–friend, tutor, confidante, teacher, parent, coach–in order to assist the freshmen in succeeding in their college careers. These newly adopted identities gave the mentors a sense of purpose and a role within the engineering college. For instance, one student stated the following:

> As a mentor, I have gained a lot by being involved with the MEP. I enjoy helping the younger students, and it makes me feel like I'm giving something back to the engineering program.

The previous comment demonstrated the sense of purpose acquired by this mentor and his self-professed sense of inclusion in the engineering community that he experienced as a result of his involvement in the minority engineering program.

Another mentor noted a change in his personal growth concerning the improvement of his communication skills in the following comment:

> I have developed my "people skills" since I have been working in the program. I have learned or am learning how to better communicate with individuals everyday. I also have gained self-enjoyment by helping the freshmen do well in their classes and stay in engineering.

Another mentor commented on the same theme:

> I feel that I have developed better "people" skills. Before I came here, I really didn't care if I met anyone. Now that I have been here a while, I actually care whether the person is actually improving academically and socially. I guess what I am trying to say is that I have become more open.

Certainly, this student became more "open," open to the growth and change which had occurred within him. Potentially, this growth and change could help him to succeed individually during the rest of his academic career in the engineering program. Certainly, he would not have experienced this degree of growth and change had he not been engaged in a mentoring relationship.

Related to growth in "people skills" as noted by the previous comments, the following mentor noted a change in his leadership skills as a result of his constant involvement with other people:

> I feel I have become a better leader because being a mentor, it is expected of me to know what's going on in detail so that I can relay it to my mentee. It has really helped my interpersonal skills.

The constant and fluid interaction between mentors and mentees allowed one mentor to note that he was "involved in the development of future leaders." Another mentor responded similarly with the following comment:

> Giving advice and encouragement to the freshmen has helped me as a student by brushing up on the skills I rarely have a chance to use and by boosting my confidence a little. I have also had a chance to meet more interesting people.

All of the comments from the mentors seemed to indicate an increased sense of self-awareness and personal understanding. Keenly aware of the personal growth and development of their mentees, the mentors seemed to shift the scrutiny to themselves in the following way: "To summarize, I feel that the program has enabled me to more accurately read myself."

This final comment emphasized the sense of belongingness and community which the mentors experienced as a result of their involvement in the program:

> Personality-wise I think it helped me meet people. For them [the freshmen], it helps them to know they are not alone. There are people here to help. It makes their jobs as students easier. Plus, they get to network to meet people.

The minority engineering program provided an opportunity for the upperclass minority students to meet and mentor other younger minority students who would become part of their network of peers. It also provided them with a role and sense of identity within a predominantly White university setting, which may otherwise have left them feeling isolated.

Frequently, mentors would make casual comments while in the interactive learning laboratory and problem-solving workshops, indicating that they wished a similar mentoring program had been in place when they were freshmen. In addition, they would visit the laboratory during non-working hours and seek academic help in upperlevel courses from other mentors. In action and casual spoken word, the mentors seemed to indicate that the opportunity to engage in professional relationships with freshman mentees as well as the opportunity to be called upon as a member of a staff of mentors within the minority engineering program was affecting their academic sense of identity and academic success. The collected written responses from the journals were consistent with this informally intimated attitude. Observations of the mentors in the laboratory revealed the themes which emerged in the journals. The data suggested that the mentors gained as much, both academically and emotionally, as their freshman counterparts.

Conclusion

MacGuire and Halpin (1995) noted that African American students who selected to drop out of this particular engineering program sought a sense of identity and belongingness in the engineering community, factors which were difficult to find as a member of the minority population. For African American students, discovering a sense of purpose and role within a predominantly White engineering program can be difficult. However, the role of mentor in this minority engineering program appears to fulfill that need partially. Landis (1995) suggested that it is the networking and the realization that minority students are not alone when confronting academic difficulties which ultimately help retain minority students who enter an engineering program, whether as freshmen or as upperclass mentors. Certainly, the journal comments suggested that the mentors were highly aware of the importance of the networking within the

engineering community. This networking could ultimately help them to achieve in their personal academic careers as well.

The mentors have gained in numerous ways as a result of their role in the minority engineering program and their relationship with their mentees. They have gained academically by striving to find new ways to clarify fundamental concepts in an engineering course of study. They have gained professionally by meeting the next generation of colleagues with whom they will work closely in future courses and on future projects. They have gained personally by becoming better communicators and achieving a sense of identity. They have become leaders and role models for other minority engineering students. Although the purpose of assuming the role of mentor is to assist someone new to a profession or undertaking, in truth, the relationship provides an exchange of benefits. The mentors are more likely to remain active and interested in their engineering program because they have formed a relationship which they value. Indeed, being a mentor is part of a "gift exchange" (Gehrke, 1988, p. 192).

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Appendix

Weekly Prompts for Mentor Journals

Week One: Now that you have completed mentor training, define what you see as the primary goals of the program. What goals need to be added, addressed, changed, or adjusted? Do you feel the students with whom you work have a sense of the purpose of the program?

Week Two: After completing a full week or more of work, how would you describe your role as a mentor in this organization? What kind of relationship do you wish to achieve with your mentees?

Week Three: What do you sense are the mentees' primary learning needs? Do you feel these needs are being addressed in the lab and the workshops? How can we better meet the needs of your mentees?

Week Four: Do you feel your mentees are comfortable in communicating their needs and concerns to you? Explain. How do you feel we can improve communication between administration, staff of mentors, and students?

Week Five: Now that we are at midquarter, please respond to the following general themes of program evaluation: What do you like most about this program? What do you like least about this program? What changes are necessary for the program to be a success?

Week Six: Do you feel your progress as a mentor and the progress of the students are being adequately monitored? What would could be done to improve in this area?

Week Seven: As we approach the end of the quarter, tell me if you think this program and your involvement in this program has been worthwhile to you as a mentor, to the students, and to the College of Engineering. Explain your response.

Week Eight: What do you think you have gained from being a mentor in this program? What do you think your students have gained as a result of their program involvement?

Week Nine: What have you learned about yourself through your participation in this program? What have you learned about the learning process and needs of other minority engineering students? How do you think the program could be improved next quarter?

Note: Many of the themes for the questions were suggested by the author in the following work:

Block, P. (1981). Flawless consulting: A guide to getting your expertise used. San Diego, CA: University Associates.